


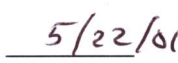


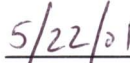


**LLNL Environmental Restoration Division (ERD)
Standard Operating Procedure (SOP)**

ERD SOP 1.15: Well Site Core Handling—Revision: 1

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1.0 PURPOSE

The purpose of this SOP is to procedure is to describe a method for collecting, handling, storing, and describing cores of sediment or rock obtained during drilling activities.

2.0 APPLICABILITY

This SOP procedure applies to all Lawrence Livermore National Laboratory (LLNL) and contractor personnel assigned to handle core obtained during drilling of boreholes in support of the Environmental Restoration Division (ERD) projects.

3.0 REFERENCES

- 3.1 Dibley, V. (1999), *Quality Assurance Project Plan LLNL Ground Water Project* (UCRL-AR-103160 Rev. 2).
- 3.2 Dibley, V., and R. Depue (October 2000), *Environmental Restoration Project Standard Operating Procedures (SOPs)* (UCRL-MA-109115, Rev. 8).

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4.0 DEFINITIONS

See SOP Glossary.

5.0 RESPONSIBILITIES

5.1 Division Leader (DL)

The DL is responsible for ensuring that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures. The DL is also responsible for providing the resources and necessary equipment required to accomplish the tasks described in this procedure.

5.2 Hydrogeology Group Leader (HGL)

The HGL is responsible for ensuring that proper procedures are implemented for field activities (i.e., drilling, borehole logging and sampling, monitor well installations and development) and to oversee the disposal of investigation derived wastes.

5.3 Subproject Leader (SL)

The SL is responsible for the overall investigation, planning, and assessment and remediation within a study or treatment facility area.

5.4 Hydrogeologist (HG)

The HG is responsible for helping the SL determine borehole/well locations and design, hydrostratigraphic analysis, and planning/evaluation of hydraulic tests.

5.5 Drilling Supervisor (DS)

The DS plans all drilling related activities and coordinates the drilling contractor, schedules, and equipment needs.

5.6 Drilling Coordinator (DC)

The DC provides the interface between the DS, SL, HG, and the field personnel and is responsible for coordinating the drilling activities with the Drilling Geologist (DG).

5.7 Drilling Geologist (DG)

The DG is responsible overseeing drilling activities and for conducting borehole logging per established operational and safety procedures and to inform the DC and SL of any nonconformances.

5.8 Core Librarian (CL)

The CL is responsible for ensuring that the core boxes are stored and maintained properly at the storage facility. The CL also updates the database to include new material.

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6.0 PROCEDURES

6.1 General

The SL or HG determine the borehole location, drilling procedures, total depth, sample intervals, and document the requirements in the Drilling Plan and Sampling Plan prior to the start of field activities. The Drilling Plan and Sampling Plan may be prepared for each borehole or a single plan may be prepared for a group of similar boreholes.

The DG must be present at the drill rig while coring is in progress. The DG observes all handling of the core by the drill crew, prepares a lithology log, documents sampling and analysis information, and oversees well site activities. As specified by the Drilling Plan and Sampling Plan, the DG collects core samples at specific intervals for purposes of chemical analyses and/or physical testing, and makes lithologic core descriptions, as well as estimates of hydrogeologic properties.

6.2 Supplies

Attachment A lists materials required at the well site for proper core handling. The DG should keep track of supplies and field forms and replenish them when necessary (Attachment A).

6.3 Core Transfer

After each core run, the drill crew retrieves the core barrel or split-barrel sampling tube from the borehole. The core barrel or split-barrel sampling tube is disassembled so the core can be examined.

6.3.1 The DG must observe the core as it is being removed from the core tube or split inner barrel. The core should be extruded in continuous motion from the core barrel or split-inner barrel into a holding trough or onto a flat table, long enough to hold the entire length of core.

6.3.2 The geologist is responsible for ensuring that the core remains in the correct stratigraphic position.

6.4 Core Handling

The DG should measure the length of core recovered in the trough prior to further transport or handling. Next, the DG should collect the samples specified in the Drilling Plan and Sampling Plan. The DG then transfers the core from the holding trough to core boxes. Care must be taken to maintain the proper stratigraphic position of the core pieces. If the core is larger in diameter than the core box, then the core may be split along the vertical axis and placed in the core box. The uppermost piece of core is put at the top left corner of the core box, and the rest of the core box sections are filled from left to right with core, working downhole, as in reading across a page of text (Attachment B).

6.5 Core Measurement and Labeling

Core measurements are made to the nearest 0.1 ft. Depths should be verified with the driller. Conventionally, all core and/or sample loss is assumed from the end of the run. If the DG determines that the next run contains material dropped from the preceding run,

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it may be credited to the preceding run and the amount of recovery and the Rock Quality Designation (RQD) properties must be adjusted as required.

6.5.1 Core runs

The DG is responsible for writing the following information on the side dividers inside of each core box:

- At the start of each run, indicate the depth on the divider.
- Indicate at least two depths for each divider,
- Indicate depth intervals where samples were collected for analysis,
- At the end of each run, indicate the depth.

6.5.2 Spacers

The DG is responsible for marking the dividers and identifying intervals with little or no core recovery or intervals of core removed for chemical analyses and/or physical testing. In addition, the use of spacers, such as plastic end caps or rolled paper, is recommended to physically mark the missing core intervals.

If the ends of the core sample are angled, the depth is measured from approximately the middle of the angled extension. The sample depth interval is also recorded on a spacer placed in the core box and on the divider at the appropriate location.

Note: A permanent marker should be used for writing on core boxes and dividers.

6.6 Final Preparation of Core Box

Final preparation includes filling the core box and checking the labels.

- 6.6.1 Core from one or more core runs may be placed in a box. Ensure that the start and stop depths of each core run, intervals of no recovery, and sample depths are recorded on the inside dividers.
- 6.6.2 Label information is written on both ends of the core box with a permanent marker. The label records the borehole designation and the depths of the upper and lower core ends in the box. If waxed cardboard boxes are used, this information is added directly to the end of the box lid. In addition, ensure that the borehole ID is written inside the box lid and on the box.
- 6.6.3 As core boxes are filled and labeled, stack them in a convenient area at the drill site.
- 6.6.4 When the borehole is finished, a marker block is placed at the end of the last run that is marked with the drill hole designation, the total depth of the hole, and the letters "TD".

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6.6.5 Radsafe check. If radioactive contamination is known to be present, the core should be sealed in plastic bags for future handling.

6.6.6 A user may require that core boxes be sealed prior to transport from the rig site in order to assure sample integrity and establish a valid Chain-of-Custody (CoC).

6.6.7 The DG is responsible for moving the core to the designated storage facility and covering the material to protect it from the elements.

6.7 Drilling and Sampling Plan

The Drilling and Sampling Plan specifies the intervals from which core is to be collected. This document also lists any special requirements for sample collection, preservation, or analysis.

6.8 Other Duties

Other well site duties may be assigned to the DG, depending on the needs of the SL or HG. These may include collecting additional samples or core tests, photographing the core, completing additional forms or daily communication with project personnel. These duties, if assigned, will be described in the Drilling Plan and Sampling Plan or in change documents. These procedures are described in the drilling and sampling SOPs.

6.9 On-the-Job-Training (OJT)

A newly hired DG will receive OJT under the supervision of a qualified LLNL technical supervisor or his/her designee. The period spent in OJT shall include core labeling, handling, and storage procedures as well as requirements for preparing lithologic logs and other LLNL documentation and forms.

6.10 Communication

The DG is responsible for communicating with the driller's helper to ensure the core remains in the correct stratigraphic position.

7.0 QUALITY ASSURANCE RECORDS

7.1 Logbooks

7.2 Field forms

7.3 CoCs

8.0 ATTACHMENTS

Attachment A—Equipment Checklist

Attachment B—Storing Core in Core Box

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Attachment A

Equipment Checklist

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Equipment Checklist

Appropriate documentation (i.e., Sampling Plan, OSP, SOP, SSP, etc.)

Buckets and Brushes

Core boxes (tops, center dividers, bottoms)

Deionized water

Detergents (Alconox, TSP)

Document control logbook

Duct tape

Field forms (i.e., CoC forms, Borehole/Well Construction Forms, etc.)

Field notebook

First aid kit

Hard Hat

Hand lens (loop)

Hearing protection

Measuring tape or ruler (engineering scale - 10ths of feet)

Munsell soil color chart

Organic vapor meter (OVM, PID or FID)

Permanent Marking Pen

Personal safety equipment

Plastic bags

Protractor

Rock hammer

Safety glasses

Safety shoes

Sample labels

Sampling gloves (vinyl, latex or nitrile, as appropriate)

Soil sample brass tubes

Soil sample tube caps

Steel spatula or putty knife

Teflon tape

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Attachment B

Storing Core in Core Box

METHOD OF STORING CORE IN CORE BOX

INSIDE OF
CORE BOX
TOP

Project
#_____

(print inside
box top)

Borehole
#_____

Depths
_____to_____

(record run
depth inside
box) ----->

INSIDE OF
CORE BOX
BOTTOM

Top	----->	----->	----->	(mark depth of each spot where core run ends)	(mark depth of each spot where core run begins)	----->
(fill across)	----->	(mark depth of each spot where samples taken)	----->	----->	----->	----->
----->	----->	----->	----->	----->	----->	----->
----->	----->	(mark depth of each spot where samples taken)	----->	----->	----->	----->
----->	----->	----->	----->	----->	Bottom	
					(end here)	

<---(record run
depth inside
box)